CHAPTER 4

TILL DEATH US DO PART? HUMAN SEGMENTATION IN FUNERARY PRACTICES IN THE MIDDLE NEOLITHIC CEMETERY CAVE OF BOM SANTO (MONTEJUNTO MOUNTAIN RANGE, PORTUGAL).

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Abstract

Ongoing multidisciplinary studies of skeletonized human remains from the Middle Neolithic Bom Santo Cave (Lisbon, Portugal) is indicating a very heterogeneous population at various levels (diets, mobility and genetics). The current interpretation suggests that its socio-economic and funerary territories encompassed the lower Tagus, its tributaries and the granitic sectors of the Mora–Pavia area in the Alentejo.

Archaeothanatological analyses indicated mutually exclusive funerary practices: secondary depositions at Room A and primary and secondary depositions at Room B. Polished stone tools are evenly distributed in both rooms, while ornaments, pottery, flint blades and sheep/goat phalanges are almost restricted to Room A.

Such distribution patterns reflects the coexistence of distinct funerary practices in which Room A is part of a much complex behaviour that included primary depositions, exhumation, transportation and re-deposition of human bone remains between different sectors of the cave and/or cemeteries (caves, dolmens) of the above-described territory. Thus, a more dynamic (in its rituals) and wider (in its geography) set of funerary practices than usually perceived — in which the intentional segmentation of human skeletons is attested — seems to have taken place at the onset of megalithism in central-southern Portugal.

Keywords: Neolithic; population studies; funerary practices; segmentation.

1. Introduction

Ongoing research at the cemetery cave of Bom Santo (Lisbon) is providing a unique and vast array of evidence on the Neolithic populations of Portugal. Together with provenance studies of raw materials and bioanthropological, genetic and multi-isotopic data from human remains, some rather unexpected funerary and ritual behaviour has been determined that push current models to radically new levels of interpretation. Osteological evidence for intentional segmentation of skeletons is an example of those newly discovered ritual behaviours.

In short, Bom Santo is a 400 year-duration snapshot of a Neolithic population coeval of, and most likely co-involved with, the building of the earliest megalithic monuments in the southern half of the country (Carvalho 2014a; Carvalho *et al.* 2012; 2016). Indeed, several types of evidence observed at Bom Santo strongly evoke "megalithic behaviours" (see below) commonly attested in dolmens elsewhere (Carvalho 2016). However, unlike most of its dolmenic counterparts built on acidic soils in neighbouring regions, it has the potential — i.e., bone preservation conditions — to provide direct insights into the buried populations and their funerary practices and rituals, such as the intentional segmentation of skeletons. Thus, it is reasonable to assume that evidence from Bom Santo may be extrapolated to the megalithic monuments where the lack of well-preserved osteological material prevents further inferences on these important research topics.

The aim of this contribution is thus to present a synthesis of ongoing research on the buried population, multi-isotopic and genetic analyses, funerary practices, and provenance of grave goods and raw materials that provide the cultural context within which the observed presence of intentional post-mortem segmentation and manipulation of human skeletons may gain significance.

2. The Bom Santo Cave evidence: population, funerary features and patterns of interaction

Bom Santo Cave is a Middle Neolithic cemetery located on the mid-slope of the north-eastern side of the Montejunto mountain range (Lisbon district), overlooking the right banks of the lower Tagus basin, at 350 metres a.s.l. (Fig. 1A – C). At the time of discovery, 1993, its existence was only deduced from a very narrow slit, hidden under a thick vegetation cover. Removal of the top sediments revealed a limestone boulder sealing the cave entrance after its last prehistoric use. The necropolis occupies the upper two of the three levels in which the cave is topographically structured (the entrance is located in the upper level), reaching a total area of around 285 m^2 comprising 11 rooms with human remains. Human footprints preserved *in situ* in a thin sandy surficial layer near the entrance are eloquent testimony of the cave's notable preservation conditions. The upper level consists of four rooms, of which Rooms A (Seven Heads Room) and B (Shell Room) were systematically excavated. The middle level, the wider one, includes seven rooms but none have been excavated to date. Finally, the lower level is filled with collapsed blocks, making progression very difficult and treacherous. Apparently, there are no funerary contexts here.

In the middle level, around 70 m from (and 25 m below) the entrance, the Bracelets Room

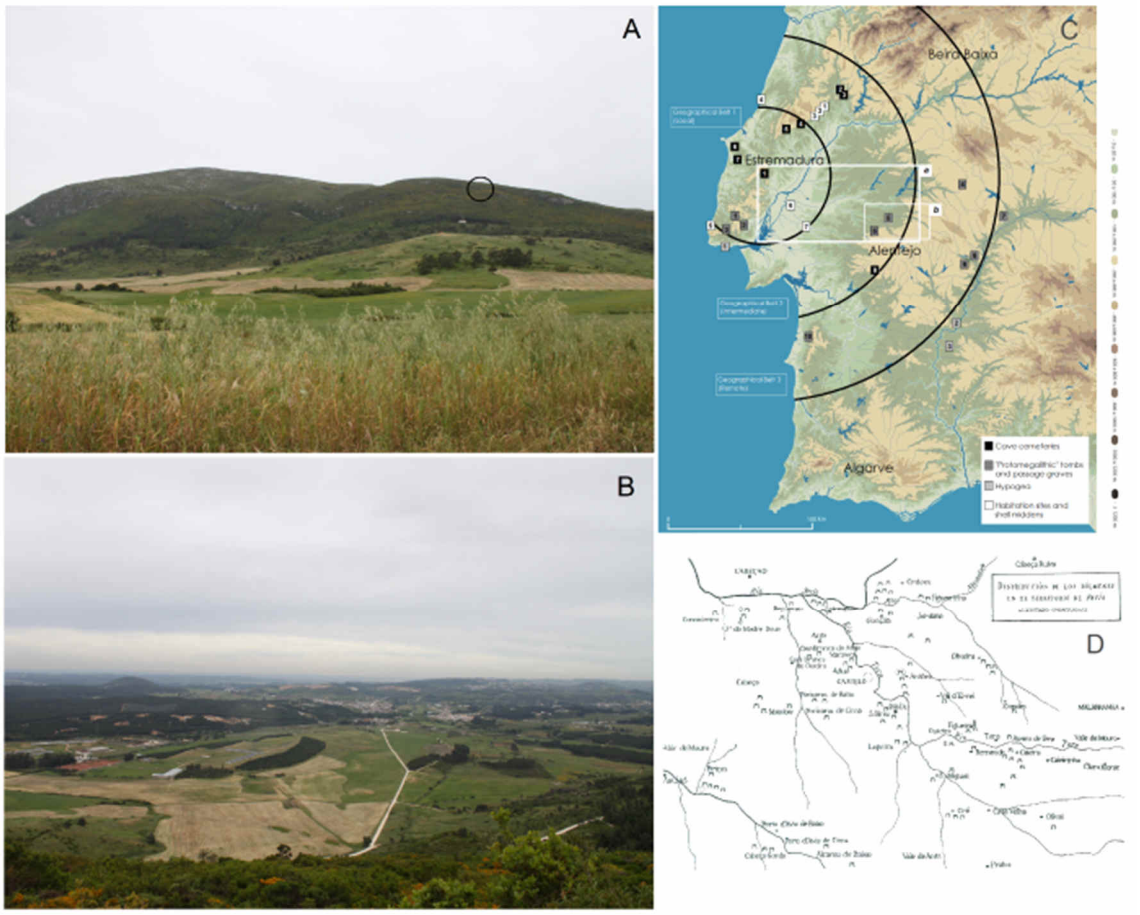

Figure 1 - A - Location of the Bom Santo Cave (circle) in the NE sector of the Montejunto mountain range, seen from the adjacent plain. B - The Tagus plain seen from the Bom Santo's entrance. C - Location of Bom Santo Cave in Estremadura and main coeval sites within the Geographical Belts 1 to 3 and its hypothetical territory (rectangle ***a***) and the Mora–Pavia megalithic area (rectangle ***b***) (after Carvalho 2014: fig. 6.1, adapted). D - Megalithic monuments of the Mora–Pavia area (after Correia 1921).
Sites names: Cave cemeteries: 1 - Bom Santo; 2 - Ossos; 3 - Cadaval; 4 - Barrão and Casais da Mureta; 5 - Lugar do Canto; 6 - Casa da Moura; 7 - Feteira; 8 - Escoural. "Protomegalithic" tombs and dolmens: 1 - Pedras Grandes; 2 - Trigache 4; 3 - Carrascal de Agualva; 4 - Rabuje 5; 5 - Cabeceira 4ª; 6 - Cabeço da Areia; 7 - Sobreira 1; 8 - Poço da Gateira; 9 - Georginos 2; 10 - Pedra Branca. Hypogea: 1 - São Pedro do Estoril; 2 - Sobreira de Cima; 3 - Outeiro Alto 2 and Quinta da Abóbada. Habitation sites and shell-middens: 1 - Costa do Pereiro; 2 - Pena d'Água Rock-shelter; 3 - Cerradinho do Ginete; 4 - Meu Jardim; 5 - Magoito; 6 - Monte da Foz 1; 7 - Moita do Ourives.

— a name deriving from the various bracelets associated with surficial funerary deposits — is one of the richest sectors of the necropolis owing to the abundance of skeletons. This room has 13 funerary clusters defined according to their location and specific topography. It lies on a north–south axis delimitated to the south by the cave wall. The shorter, west–east axis is rather irregular due to the presence of huge boulders. However, despite rigorous topographic surveying and description (Duarte 1997; Carvalho, Regala 2014), the striking singularity of this room had gone unrecognized until a visit to the cave on November 21st, 2015, when a "megalithic construction" — symptomatically nicknamed "The Altar" — and an anthropomorphic stele were identified (Fig. 2). These two structures, which to our knowledge are unique in Neolithic cave cemeteries in Portugal, were preliminarily described as follows (Carvalho 2016):

> 1 - Aligned against the room's eastern wall, there is a roughly square, thick limestone slab resting on two boulders (one at each end), thus forming the so-called Altar. Both boulders and the back of the slab lie directly on the limestone floor (a naturally elevated and flattened platform), in the contact between it and the ceiling. At the time of the discovery there were two amphibolite adzes *in situ*, on top of the slab, symmetrically placed at each of its ends.

In the slab's central area, there is a large parallelepiped boulder lying on one of its long sides.

2 - Immediately in front of these structures there is a monumental stele resting on top of limestone boulders that crown the platform on its western side. The stele is anthropomorphic in shape, resembling well-known examples associated with (or reused in) megalithic buildings across western and southern Iberia (e.g., Bueno *et al.* 2015). Clearly, this is an impressive monument, with notable topographic — and therefore symbolic — prominence within this true funerary chamber.

Where the room's ceiling meets the back of the megalithic structure, there are crushed human bones. Similarly, under The Altar's slab and all over the adjacent platform there are more crushed and, at least apparently, burnt human bones along with schist discoid beads and tiny fragments of charcoal. All these remains are embedded in a thin humic layer that covers the limestone bedrock (Fig. 2B – D). These pieces of evidence strongly suggest the existence of a cremation area at Bom Santo, which is an extremely rare find in Neolithic cemeteries in Portugal.

At this point in the research, 3D laser-scanning and modelling with LIDAR technologies are still in progress and further work in Bracelets Room will be unavoidable in the future for thorough recording and sound interpretation of these structures and associated funerary and cult contexts. The only rooms that have been excavated so far — Rooms A and B — are located immediately below the steep slope that connects them to the entrance, in the cave's upper level. Sediments form a ca. 40 cm-thick homogeneous deposit. Together with a very coherent material culture, this stratigraphy suggested a single period of use, a deduction confirmed by 19 radiocarbon results that point to a timespan of ca. 400 years (3800–3400 cal BC). As will be discussed below, these rooms were most probably intended for distinct funerary practices, with Room B being used for both primary and secondary depositions, and Room A mostly, if not exclusively, used for secondary depositions (Gonçalves *et al*. 2016).

Human remains from 15 individuals were sampled for systematic analyses (Table 1). To avoid repetition of results, individuals #01 and #02 (in partial anatomical connection) were chosen alongside 12 lower mandibles (#03 to #14), plus the so-called "hunter", from Hunter's Room (#15). Albeit representing only 20% of the population in Rooms A and B (14 out of 71 individuals), this is the first case in Portugal where a chronologically well-defined Neolithic population is fully characterized regarding basic bioanthropological traits (morphology, sex and age at death), direct AMS dating, ancient DNA, palaeodiet (carbon and nitrogen isotopes) and mobility (oxygen and strontium isotopes) at individual level (for a synthesis, see Carvalho *et al*. 2016). The main results are the following:

1 - Genetic analyses revealed the prevalence of sub-types of mitochondrial haplogroups U5, J and H, followed by haplogroups T, HV0 and K. Overall, this genetic composition indicates outstanding mitochondrial diversity that sharply contrasts with evidence from other Neolithic burial sites in the Iberian Peninsula (Carvalho *et al.* 2016: table 5), a fact that suggested the role hypothetically played by systematic exogamic practices as an explanation for the above pattern.

2 - Isotopic insights into palaeodiets indicate a preference for predominantly terrestrial food-sources. However, most individuals (9 out of 15; 60%) also show isotope values indicative of a diet composed by ≥20% of freshwater foodstuffs. This trend parallels the coeval dolmen of Cabeceira 4 (Carvalho, Rocha 2016), located in the upper section of the Sorraia River, at the time a natural route connecting the lower Tagus valley with the Alentejo hinterland. Indeed, this assessment of higher freshwater input in diets is in keeping with the landscape: in the mid-Holocene, the northern limit of the Tagus' brackish waters was located to the north of Bom Santo and resulted in the formation of a very large estuary (reaching 15 km wide) with tributaries permitting upstream navigation to the hinterland and the economic exploitation of abundant wild resources.

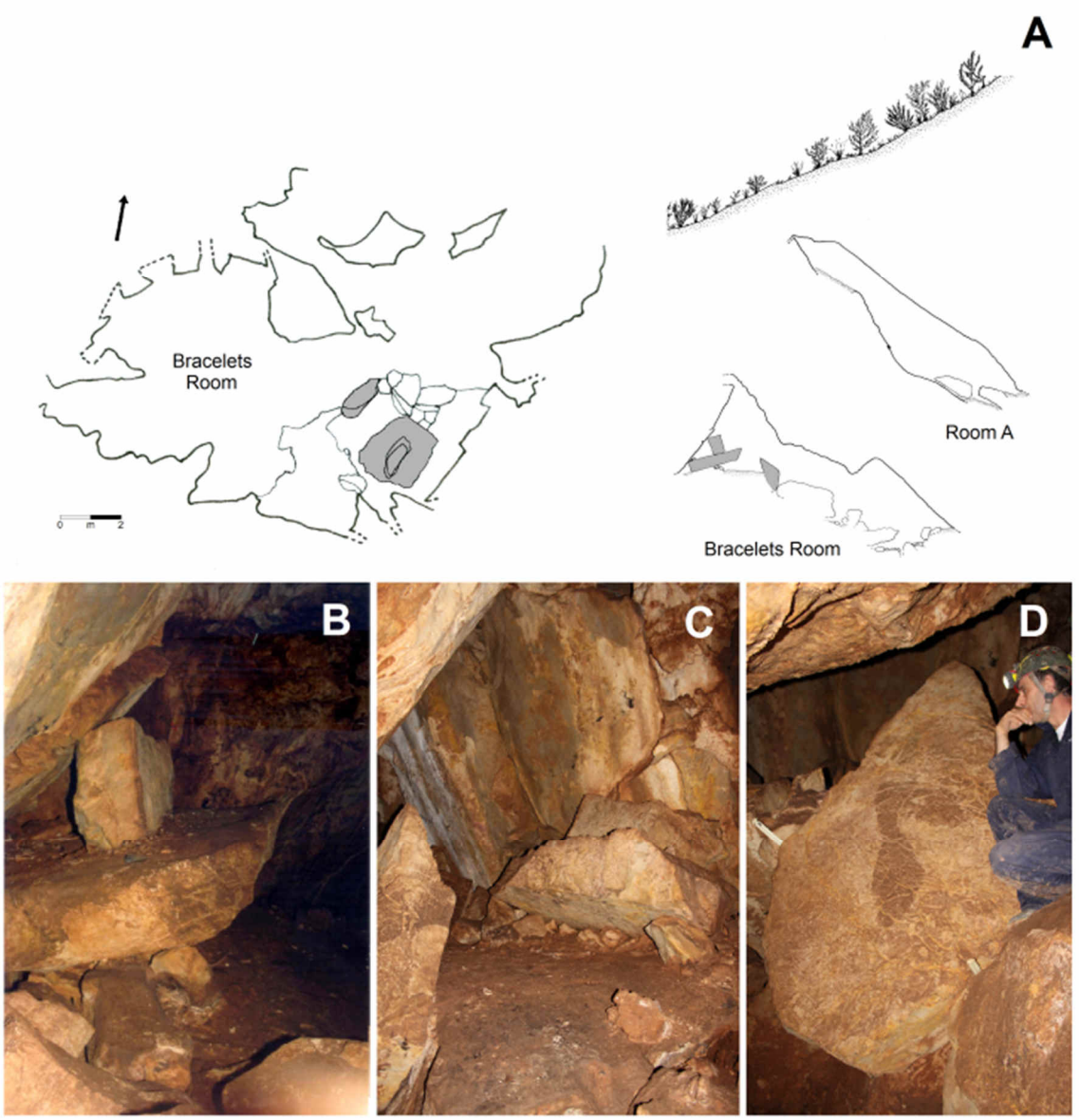

Figure 2 - A - Simplified plan of Bracelets Room (left) and topographic profile (right), with indication of the stele and megalithic construction (The Altar) in grey. B - The Altar seen from north. C - General view of from south, with top of stele (left), platform with crushed (and burnt?) human remains (centre) and The Altar (right). D - Anthropomorphic stele in frontal view.

3 - Strontium isotopes from human tooth enamel show a continuous 0.7103–0.7136 range. Five red deer and sheep/goat bone samples established a preliminary local baseline of 0.7105. If some inherent limitations are excluded from the reasoning — the lack of comprehensive regional "isoscapes", the use of bulk enamel samples analysed by TIMS, not by LA-MC-ICP-MS, etc. — , the obtained results indicate that most individuals (12 out of 15; 80%) are non-local, having spent their childhood in, or regularly visited areas with higher local $^{87}Sr/^{86}Sr$ values. Two out of the three sheep/goats also exhibit a non-local origin (0.7122 and 0.7134). The nearest regions with high local $^{87}Sr/^{86}Sr$ values are the granitic plains in the Alentejo, to the east, accessible through the Tagus estuary and its tributaries, namely the Sorraia (Fig. 1C). In the face of these results, a first interpretation of the Bom Santo isotope data favoured a model with a mobile farming population associated with itinerant pastoralism.

Reinforcing the above conclusions, provenance analyses carried out on grave goods suggest a broad cultural integration of the Bom Santo population (Carvalho 2014b; Carvalho *et al.* 2016):

1 - Pottery consists of undecorated vessels of simple geometric forms, repeating well-known typologies from Middle Neolithic burial-caves and dolmens. However, although locally made, vessels show rather distinct fabric recipes and testify technological variability that sharply contrasts with uniformity in morphology. In particular, the recipe of one vessel is typical of the Rio Maior area, 30 – 35 km north of the cave, suggesting an import.

2 - Polished stone axes and adzes are made of amphibolite, meta-volcanic and sedimentary or meta-sedimentary rocks. With the exception of the latter type of rocks, which are locally obtained, all others are exogenous: the closest sources of amphibolite are found along the western borders of the Hesperian Massif (90–100 km to the east) while meta-volcanic rocks can be found in the Lower Alentejo and at the Sado river mouth (respectively, 150 km and 80–90 km south).

3 - The knapped stone assemblage is formed by elongated products (blades and bladelets) and geometrics (trapeziums). Ongoing petrographic analyses (H. Matias, A.F. Carvalho, work in progress) indicate the presence of three main types of flint: one found in siliciclastic deposits of the Tagus Sedimentary Basin, thus a locally available resource; another of undetermined provenance but surely from more distant sources; and a third one, represented by a single blade (the largest in the entire assemblage), probably imported from the Milanos Formation in the Baetic System (Spanish Andalusia), around 400 km to the south-east.

4 - Bone awls from Bom Santo were obtained by splitting long bones longitudinally, whereas at other coeval sites—e.g., Escoural Cave, in the Alentejo region (Fig. 1C)—morphologically similar awls were obtained by thinning, not splitting into two equal halves. These examples from contiguous regions are testimony of different technical options aimed however at the same, culturally determined end-product.

5 - Personal ornaments are diversified but most raw materials (limestone, shell) could have been obtained between the Tagus estuary and the nearby Atlantic coastline. Only schist beads may have been brought to the cave from more distant sources. Wherever taphonomic environments allow their preservation, Middle Neolithic cemeteries in the Alentejo yield the same adornment types.

Overall, these observations suggest a scenario where distinct groups with their own technological options and geological constraints are incorporated in larger cultural or political units that share common stylistic behaviours (plain, spherical pots; thinly elongated awls; trapezoidal arrowheads; ornaments made of marine molluscs). However, the large and geologically heterogeneous geographical area where these phenomena are attested suggest variable strategies of acquisition and/or exchange of artefacts and raw materials and thus different scales of interaction with the environment and between human groups.

3. Intra-site spatial analysis and funerary practices

Gonçalves *et al.* (2016) performed a spatial analysis of selected human remains and grave goods from Bom Santo's Rooms A and B, an exercise that revealed recurrent distribution patterns.

Regarding the abundant human skeletal remains (7465 bones and bone fragments, and 2039 teeth), the purpose of the examination was to assess if the two rooms presented differential funerary practices (primary and/or secondary). As will be shown below, both primary and secondary depositions were present in Room B while only the latter were clearly present in Room A. This scenario raised a twofold hypothesis: that remains from both rooms could represent two different funerary practices, and that Room A could potentially be the final destination of

skeletons primarily deposited elsewhere. The latter issue will be focused in the conclusions section.

Indeed, in comparison with Room B, Room A presented better long bone completeness (Table 2) and much smaller absolute frequencies of bones with labile joints (such as phalanges from the hand and feet) although frequencies for long bones were similar for both rooms (Carvalho *et al.* 2012; Granja *et al*. 2014; Gonçalves *et al.* 2016). A minimum number of 36 individuals in Room B and 35 individuals in Room A has been estimated based on the repetition of lower right first molar so similar frequencies were expected if the same practice had been implemented in both rooms. However, the frequencies of hand distal phalanges (HPh) and foot distal phalanges (FPh) were quite different (Fig. 3), with a large number in Room B (HPh n=153; FPh n=81) and a very small number in Room A (HPh n=19; FPh n=25).

The above results reinforced the hypothesis proposing that the two rooms had been used for somewhat different practices. However, the matching of antimere bones or of contiguous bones from the same individual was successful only for intra-room human remains. No successfully matching involved bones located in different rooms. Therefore, no clear evidence favouring a direct association between the two rooms has been found. In short, the available evidence indicates the adoption of two different and separate funerary practices in Room A (where only secondary depositions are attested) and Room B (where both primary and secondary depositions were found), despite their contiguity.

Grave goods were also taken into consideration. The provenance of raw materials is indicative of mobility indexes or exchange networks. As seen in the previous section, some raw materials are geographically-specific, and their transport from one location to the cave site can be interpreted as the result of exchange and/or mobility. Therefore, they may be used to pinpoint the geographical origin of human groups or single individuals and to assess their interactions. However, the present study added another dimension: the grave goods spatial scattering patterns at the intra-site level of analysis. This was examined and used to explore their possible association with differentiated funerary practices.

Differences in grave goods between Rooms A and B were investigated by looking at the distribution of personal ornaments, pottery and polished and knapped stone tools in each excavation square (Fig. 4). This analysis showed an uneven distribution, with the large majority of the ornaments, flint blades and potsherds being found in Room A. Ornaments, in particular, showed a notable concentration in B4 and immediate squares, allowing their interpretation as elements of maybe a few composite necklaces made with materials from different sources (shell and schist beads). The exceptions were the polished stone tools, which were evenly scattered in both rooms and thus testify different behaviour. However, these distribution patterns of raw materials are always independent of their specific geographical area of acquisition, thus showing that there is no latent spatial segregation according to provenance (Fig. 4).

4. Discussion: the “fragmentation thesis” at Bom Santo

The present approach to the “fragmentation thesis” (Chapman, Gaydarska 2007) at the burial-cave of Bom Santo relies on a couple of assumptions: first, that Rooms A and B yielded well-preserved funerary deposits that constitute reliable material testimony of the funerary and ritual behaviours that took place there, as evidenced among other features by the intentional closure of the cave in Neolithic times or the preservation of human footprints in Room C; and second, that the evidence still contained in the meagre sedimentary deposit that remain unexcavated in Room A will not distort the general patterns in the spatial distribution of grave goods and human remains. With the above assumptions in mind, a preliminary interpretation of the observed funerary practices can be summarized as follows:

> Room A—or a major section of it — must have been exclusive for secondary depositions of human remains (i.e., segmented skeletons) associated with all types of grave goods.
>
> Room B shows evidence for both primary (i.e., intact skeletons) and secondary depositions associated only with sheep/goat phalanges and polished stone tools.

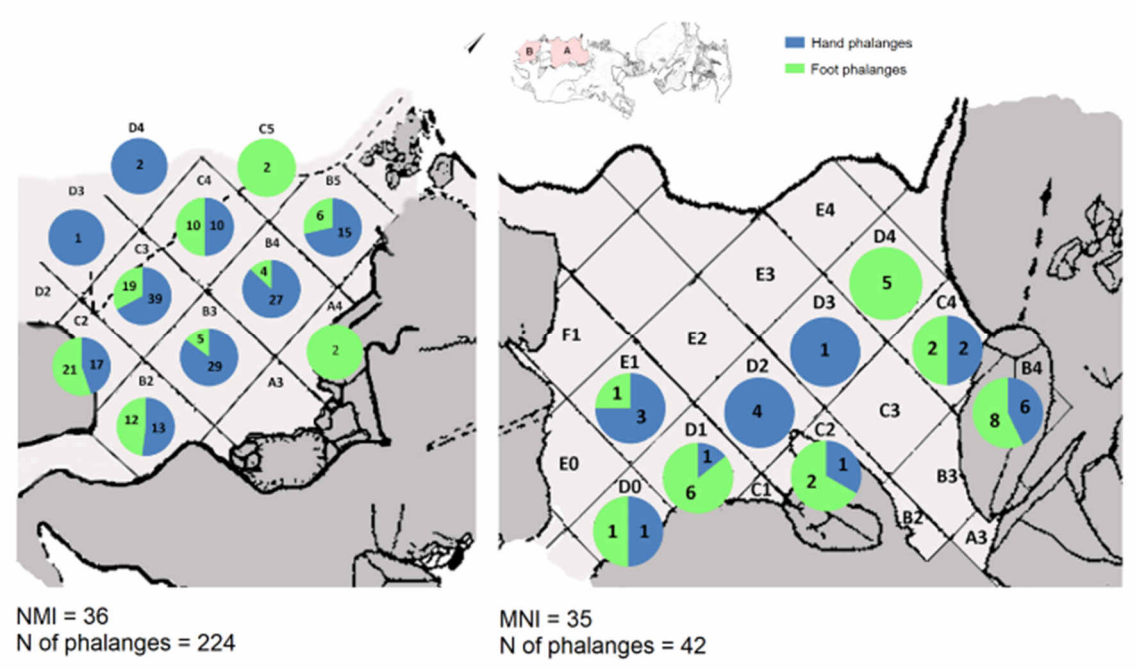

Figure 3 - Frequency and dispersion of human hand and foot distal phalanges in Rooms A and B of the Bom Santo Cave.

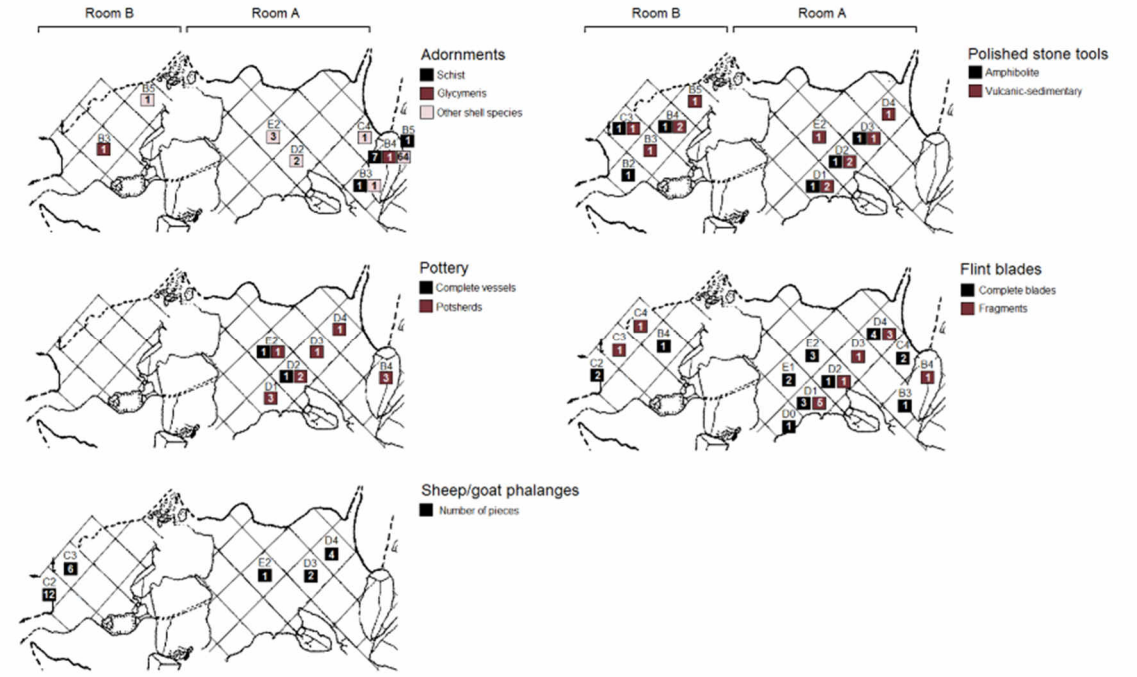

Figure 4 - Spatial patterning of main grave good types in Rooms A and B of the Bom Santo Cave.

Based on the above interpretations, Room A implied the segmentation—more likely than actual bone fragmentation (Gonçalves *et al.* 2016; Granja *et al.* 2014)—of skeletons previously deposited elsewhere, and apparently left to decompose naturally, since no marks of intentional de-fleshing were identified. The transportation of human bones to this room would take place subsequently. It is possible that some of the remains present in this Room corresponded to disturbed primary depositions which would mean that not all remains have been transported from elsewhere. However, given the current evidence, potential primary depositions could hardly explain the entire assemblage. If primary depositions indeed occurred, these appear to have represented a very small part of it. Interestingly, Room A is the only funerary space where personal ornaments and pottery were also found (Fig. 4), which means that the former grave goods are intrinsically associated with practices of secondary handling of human remains.

Even more interesting is perhaps the fact that pottery may have been intentionally fragmented at some point in this sequence of decomposition-exhumation-transportation-redeposition of human remains. In fact, pottery was found in very small quantities — two complete vessels, two rimsherds (one decorated) and 11 loose sherds — but its scarcity is in good accord with evidence from other Middle Neolithic cemeteries, a fact that ultimately has to be considered a cultural option. However, at Bom Santo these sherds also testify the presence of independent, incomplete vessels that could not be refitted. If the above assumptions are considered, it can only mean that pots were fragmented elsewhere and some potsherds incorporated into the funerary deposit only subsequently, behaviour akin to that of the treatment of the human skeletons.

Systematic breakage was also observed in the flint material. Refitting exercises permitted only two blades — one from each room — to be reconstituted. The total number obtained of 37 individual pieces present the following fracture patterns: intact pieces: n=20 (54%), proximal: n=7 (19%), mesial: n=5 (13.5%), and distal fragments: n=5 (13.5%). As in the case of the pottery, this high fragmentation index and the lack of the missing parts strongly suggests in the majority of these cases that this is not the effect of trampling or sediment compression only, but rather also of intentional behaviour.

Apart from 20 bone tools (mainly awls), the large and medium-sized mammal remains from Bom Santo are mostly phalanges of sheep/goat. At the time of the excavations, this was a surprising find. A first interpretation was that phalanges may have been attached to skins that were left as funerary offerings or used as shrouds to wrap the dead. However, the recent publication of the Sobreira de Cima, Outeiro Alto 2 and Quinta da Abóbada hypogea also noted a very explicit *in situ* association between sheep/goat and human phalanges in Middle Neolithic funerary contexts in the Alentejo (e.g., Valera, Costa 2013). In the case of Bom Santo, these were found comingled with the human remains but clearly in very restricted locations — particularly square C3 in Room B, where 18 sheep/goat phalanges were found in close association (Fig. 4) — , thus suggesting an original deposition in anatomical connection (along with the identified primary depositions of human skeletons?). Overall, the formal and ritual resemblance with the above hypogea is even more striking.

5. Conclusions

Spatial distribution of grave goods at Bom Santo revealed some rather unexpected patterns indicative of rather complex funerary practices (Gonçalves *et al.* 2016) and of the different roles likely played by accompanying grave goods. Indeed, some items seem to be specific to secondary funerary contexts (flint blades, pottery and ornaments in Room A), others to primary practices (sheep/goat phalanges in square C3 of Room B), while others do not seem to be correlative of any particular type of practice (polished stone tools). Also, flint blades, pottery vessels and human skeletons were frequently (but not constantly) segmented at some point in these practices. This is eloquently attested in Room A. As with the relation between human and sheep/goat phalanges, the parallel between segmentation of skeletons and fragmentation of vessels suggests the existence of some sort of homology between humans and pots in the ideology underlying these funerary rituals. Although less clearly attested, intentional fragmentation of flint blades may also

be associated with this principle. On the other hand, the ubiquity of polished stone tools within Rooms A and B remains to be given a more intelligible meaning. It should be mentioned, however, that polished axes and adzes must have been imbued of a special significance in the Neolithic given a twofold phenomenon: their omnipresence in burial-caves and dolmens throughout the country — namely in the neighbouring Alentejo (e.g., Gonçalves 1992) — and their explicit depiction in dolmens and menhirs.

One important question remains to be explicitly addressed: where did initial burials take place prior to the incorporation of the bone remains in Room A? Given the unlikelihood of adjacent Room B (Gonçalves *et al.* 2016; see above), two non-mutually exclusive possibilities can be put forward: from other (unexcavated) sectors of the burial-cave and/or from built cemeteries elsewhere (Fig. 1C). The first possibility can only be assessed in future excavations but the socio-economic structure and ideology of Middle Neolithic (i.e., megalithic) populations that are now being unfolded in Portugal, mainly at Bom Santo, provide sound guidelines to explore the latter possibility.

To start with, the attested long-distance import of grave goods is a crucial observation that allowed three successive geographical belts of provenance — "local", "intermediate", "remote" — to be drawn (Carvalho 2014b: fig. 6.1; see Fig. 1C). Within these belts, which display disparate geological and orographic features, variable levels of strategies of acquisition and/or exchange of artefacts and raw materials were used, resulting in different scales of interaction with the environment and between human communities. Integration of the available isotopic evidence on human diets and mobility permitted the building of an interpretative model in which the Bom Santo population directly exploited a territory comprising the Montejunto range, the Tagus palaeoestuary, and the plains of neighbouring Alentejo, including the westernmost fringes of the granitic and schistose formations of the megalithic Mora-Pavia area (Fig. 1D) — in short, the "local" and "intermediate" geographical belts. The proposed overall interpretative model foresees "[...] a cemetery used by coeval human groups with complex funerary practices but sharing a similar material culture and belonging to a common political entity, most likely a 'segmentary society' occupying a large territory with practices of exogamy predominating [as suggested by the mitochondrial DNA variability]" (Carvalho *et al*. 2016: 21).

However, this is a purely socio-economic model. The above evidence for complex sequences of funerary practices (involving intentional, systematic segmentation of human skeletons and their transportation), along with the finding of typically "megalithic structures" (see above), are observations that shed new light on the Bom Santo burial-cave at two main scales of analysis (Carvalho 2016): first, at the level of the funerary practices, rituals and cults that might have taken place inside the cave (as particularly evidenced in Bracelets Room; Fig. 2) — i.e., the mountain acting as a dolmen chamber; and second, at the understanding of the role played by Montejunto itself in the surrounding landscape (Fig. 1A – B) — i.e., the mountain acting as a mound.

In this new context, the deduction that Room A was most probably used for secondary depositions only, with human remains being introduced from outside the cave, suggests that it must have been a small part of much wider, more complex funerary behaviour in the framework of which a chain of practices — primary depositions (with de-fleshing), exhumation, transportation and secondary deposition (of segments of skeletons) — would take place in distinct cemeteries across the landscape. Coeval burial-caves and dolmens in Estremadura and dolmens and small graves in the nearest sectors of Alentejo — in particular, along the Sorraia river valley and the adjacent Mora-Pavia plains (Fig. 1C–D) — are thus likely to have been involved in these broader dynamics of spatially and conceptually segmented funerary practices. The above-defined socio-economic territory of the Bom Santo population must have been also a stage for the structured funerary and ritual practices.

If confirmed by future research, observations made possible at Bom Santo due to its more favourable preservation conditions may be extrapolated to those other cemeteries where similar direct evidence cannot be obtained. In particular, this would be the case, not only of the intentional segmentation of skeletons, but also of the ritual use of sheep/goat phalanges (associated with primary depositions) and pottery vessels or potsherds (associated with secondary depositions) as homologs for humans. Thus, the presence of "non-local" sheep/goat remains does not have to be

necessarily evidence for itinerant pastoralism, as was tentatively (but not exclusively) put forward before (Carvalho *et al.* 2016). Systematic provenance studies of abiotic raw materials (e.g., flint) from coeval Mora-Pavia dolmens and open-air habitation sites will be crucial to assess this model.

The onset of megalithism, at least in the mentioned territories, seems to have been characterized by complex funerary behaviours in which intentional segmentation of corpses and particular objects may be the material manifestation of a segmented frame of beliefs — and maybe also of a segmented worldview.

Acknowledgments

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Table 1. Bom Santo Cave: Biological profile, mtDNA haplotypes and haplogroups, isotopes and radiocarbon dating of the buried population (a).

Burial	Room	Sex	Age	Haplotypes	Haplo-groups	Strontium isotopes	Marine proteins	Aquatic proteins	^{14}C (cal BC)
#01	B	M?	A	16270T, 16296T	U5b	0.710265: Local	3%	7%	3455 ± 55
#02	B	M	A	16126C, 16294T, 16304C	T2b	0.711009: Non-Local	6%	6%	3415 ± 110
#03	B	F?	A	-	-	0.711296: Non-Local	9%	33%	3725 ± 40
#04	B	M	A	16126C, 16332T	J	0.712836: Non-Local	11%	39%	3675 ± 25
#05	B	M	A	-	-	0.710503: Local	10%	23%	3705 ± 35
#06	B	M?	A	16195C, 16298C	HV0	0.712517: Non-Local	5%	19%	3540 ± 75
#07	B	M	A	16221T	H10e	0.713594: Non-Local	4%	31%	3735 ± 45
#08	B	I	A?	-	-	0.711508: Non-Local	5%	26%	3520 ± 85
#09	B	I	J	(16189C), 16224C, 16311C	K1a2a1	0.710619: Local	8%	18%	3565 ± 55
#10	B	M	A	16126C, 16196A, 16259T	J	0.711235: Non-Local	10%	6%	3580 ± 45
#11	A	M	A	-	-	0.711783: Non-Local	12%	16%	3540 ± 75
#12	B	F?	A	16239T, 16292T	H1	0.711702: Non-Local	2%	24%	3555 ± 65
#13	A	F	A?	-	-	0.712348: Non-Local	4%	29%	3530 ± 80
#14	B	I	A	16221T, 16256T, 16270T	U5a1	0.712266: Non-Local	6%	42%	3780 ± 65
#15, Hunter	-	M?	A	not analysed	not analysed	0.714641: Non-Local (b)	8%	25%	3735 ± 45

(a) After Carvalho *et al.* 2016: tables 3 and 4, updated. Sex: M - male; F - female; I - indeterminate. Age: A - adult; J - juvenile.
(b) Unpublished result.

Table 2. Completeness of each skeletal element according to Room A and Room B (a).

Element	Room A				Room B				Total			
	n	$\overline{X}$	Md	SD	*n*	$\overline{X}$	Md	SD	*n*	$\overline{X}$	Md	SD
Cranium	585	3.89	4.00	0.52	828	3.89	4.00	0.53	1413	3.89	4.00	0.53
Mandible	40	3.38	4.00	0.93	70	3.16	4.00	1.14	110	3.24	4.00	1.07
Teeth	677	1.51	1.00	0.82	749	1.27	1.00	0.58	1426	1.38**	1.00	0.71
Vertebral column	290	2.82	3.00	1.17	623	2.90	3.00	1.14	913	2.87	3.00	1.15
Ribs	202	3.35	4.00	1.05	341	3.38	4.00	0.98	543	3.37	4.00	1.00
Sternum	11	3.45	4.00	0.93	35	3.29	4.00	0.99	46	3.33	4.00	0.97
Clavicle	38	1.95	1.00	1.18	51	2.47	3.00	1.24	89	2.25*	2.00	1.24
Scapula	30	3.87	4.00	0.35	67	3.70	4.00	0.70	97	3.75	4.00	0.61
Humerus	61	2.34	2.00	1.17	57	3.02	4.00	1.17	118	2.67**	2.50	1.21
Radius	42	1.95	1.00	1.23	76	3.00	4.00	1.21	118	2.63**	3.00	1.31
Ulna	38	1.79	2.00	0.81	65	2.74	3.00	1.18	103	2.39**	2.00	1.15
Hand	229	1.57	1.00	0.90	923	1.38	1.00	0.80	1152	1.42**	1.00	0.83
Hip bone	56	3.68	4.00	0.51	89	3.58	4.00	0.77	145	3.62	4.00	0.68
Femur	75	2.32	2.00	1.14	109	3.17	4.00	1.16	184	2.82**	3.00	1.22
Patella	26	1.31	1.00	0.83	32	1.16	1.00	0.45	58	1.22	1.00	0.65
Tibia	77	2.18	2.00	1.14	96	3.02	4.00	1.20	173	2.65**	2.00	1.24
Fibula	44	2.09	2.00	1.03	67	3.13	4.00	1.15	111	2.72**	3.00	1.22
Foot	316	1.54	1.00	0.90	825	1.61	1.00	1.04	1141	1.59	1.00	1.00
Total	2837	2.45	2.00	1.32	5103	2.39	2.00	1.35	7940	2.42*	2.00	1.34

(a) After Gonçalves *et al.* 2016: table 1. *n* = amount of fragments; $\overline{X}$ = mean; Md = median; SD = standard deviation. Statistically significant mean differences between both rooms: *p < .05; **p < .01. Mann-Whitney statistics was used. Carpal and tarsal bones are included in the hand and foot categories, respectively.